True Translation of PCT/EP2005/003440 as filed on April 01, 2005

21974.9

METHOD FOR HANDLING A BLISTER IN A BLISTER PACKAGING MACHINE AND DEVICE FOR CARRYING OUT SAID METHOD

The invention concerns a device for relocating a blister in a blister packaging machine, wherein the blister can be detected at a supply location using a relocating device, and can be disposed at a deposition location of a continuous conveying device, which is operated in cycles. The invention also concerns a method for handling a blister in a blister packaging machine, wherein the blister is grasped at its supply location by a relocating device and is disposed at a deposition location of a continuous conveying device, which is operated in cycles.

In a blister packaging machine, a plurality of cups are formed in an endless sheet web, into each of which one or more products are disposed, which may e.g. be pharmaceuticals, in particular, tablets or capsules. A covering foil is subsequently sealed thereon which tightly encloses the products in the cups. The blister band formed in this manner is separated in a punching or cutting unit into blister strips (called blisters below).

In a conventional blister packaging machine (DE-A 29 22 171), the blister is grasped at the punching or cutting unit by a relocating device and is disposed on the upper side of a continuous conveyor belt. The relocating device comprises a rocker which can be pivoted about a bearing which is fixed to a frame and carries a rotatable head at its free end which has several suctioning means for receiving one blister each. The conveyor belt carries walls or fingers disposed at mutual separations, between each of which one cell is formed. A blister is inserted into each cell and further transported by the conveyor belt.

In particular for packaging medication, it is often necessary to fill several blisters into a folding box or into another package. Towards this end, a stack comprising a particular number of blisters must be formed from the individual blisters, which is then packed in the folding box or the other package. A special stacking unit is provided to form the stack, which is disposed at the end of the conveyor belt. The blisters which were recognized as being incomplete and/or improperly sealed are rejected directly upstream of the stacking unit, and the presence of the blisters is checked. This requires substantial equipment and handling expense in order to form a stack from a desired number of blisters, which can be transferred to a downstream cartoning device. Moreover, changing the blister format requires a plurality of adjustments and modifications which increases the downtime of the packaging machine.

DE 199 17 436 C2 describes a device for relocating a blister to a conveying device. The relocating device is designed as a lowering device which passes through the punching tool in order to deposit the blisters on the conveying device, disposed below the punching tool. The relatively long cycle time required for relocating the blister is particularly disadvantageous, since the punching tool is blocked during downward transport of the blister onto the conveying device, and relocation must also be performed in dependence on the blister band advance.

It is the underlying purpose of the invention to introduce a device and a method of the above-mentioned type for forming a stack from several blisters in a simple and rapid fashion.

The above-mentioned object is achieved with a device having the characterizing features of claim 1. Several blisters can thereby be stacked at the deposition location of the conveying device using the relocating device to form a stack. The relocating device has a main arm which can be

pivoted about a first pivot axis using a first drive device, and a side arm which is disposed on the main arm and which can be pivoted relative to the main arm about a second pivot axis using a second drive device, and which carries a device for receiving the blister. The main arm and side arm can preferably both be pivoted in two directions, thereby allowing a reversing motion, wherein, in each case, the drive device is a directly controlled servomotor.

The main arm, which is advantageously much larger than the side arm, substantially bridges the separation between the supply position and the deposition location, while fine positioning of the blister is performed substantially through control of the side arm and its pivoting motion relative to the main arm. The overlapping pivot motions of the main arm and side arm produce the resulting motion of the blister between the supply position and the deposition location, wherein the relocating device performs various main arm and/or side arm motions for various blisters of the stack in order to thereby bring the blister as close as possible to its final position within the stack.

Several cells, formed by walls or fingers, are preferably disposed on the conveying device, which may be an endless circulating conveyor belt, each of which defining a deposition location for stacking blisters. The relocating device is thereby preferably lowered into the cell during a relocating motion of a blister. In this fashion, the blister to be deposited is discharged at or at least close to its position within a stack to be formed to ensure precise positioning of the blister.

In a preferred embodiment, the first pivot axis of the main arm and the second pivot axis of the side arm extend parallel to each other. The first pivot axis of the main arm may thereby be fixed to a frame, while the

second pivot axis of the side arm is formed on the main arm and is moved therewith.

The separation between the two pivot axes can be changed in a simple manner by changing the freely projecting length of the main arm through axial displacement thereof for adjustment to greatly varying blister formats. Moreover, the separation between the two pivot axes may be changed during the relocating motion using a further drive device.

The receiving device, which is disposed on the side arm and retains the blister during relocation, may be a conventional suctioning device. In a preferred embodiment of the invention, the supply location may be formed directly on the punching or cutting device used for separating the blister from a blister band. That section of the blister band which forms the blister to be separated, is grasped by the receiving device or suctioning device already prior to activation of the punching or cutting device, and the blister is subsequently separated from the blister band, with the blister already being safely held by the relocating device.

The relocating device is preferably disposed on the side of the blister opposite to the punching or cutting device, such that the relocating process is entirely independent of the punching and/or cutting process, thereby also preventing any collision between the relocating device and the advancing blister foil.

In order to reduce the relocating paths and, in particular, facilitate lowering of the relocating device into the cells of the conveying device, the relocating device may preferably be disposed between the punching or cutting device and the conveying device.

According to a further development of the invention, an ejector shaft may be provided into which the blister is introduced by the relocating device in order to reject incomplete and/or improperly sealed blisters. The ejector shaft preferably comprises a scraper for scraping the blister off the receiving device. The blister released in this fashion falls into the ejector shaft and is supplied to a collecting station for blisters to be rejected.

This object is achieved in view of the method by the characterizing features of claim 12. The blisters are thereby stacked to form a stack directly at the deposition location during one cycle of the conveying device. In accordance with the invention, the blisters are stacked directly upon transfer to the conveying device, such that a downstream stacking unit can be omitted. One single cycle of the conveying device terminates when the desired stack has been built up on the conveying device or the conveyor belt by the relocating device. The stack of blisters formed in this fashion may be transferred directly from the conveying device for further processing, e.g. to a cartoning device, and when the blister format changes, only very few adjustments are required, since the stacking unit is omitted.

Since the various blisters of the stack are associated with different motions of the relocating device, the relocating device may be lowered more deeply into the cell for the lower blister of the stack than for the upper blister of the stack when several cells are formed on the transport device, in each of which one blister stack is stacked. The different motions of the relocating devices for the various blisters of the blister stack ensure that the blisters are each discharged by the relocating device in the vicinity of their target positions within the stack so that the blisters do not fall in an uncontrolled fashion which could cause bouncing and tilting of the blisters. Each motion of the relocating device may thereby be performed very quickly and without considering the advance of the blister

band. The receiving device can grasp each individual blister or several blisters at the same time.

The blisters must be conventionally separated from a blister band using a punching or cutting device. In a preferred embodiment of the invention, the supply location is formed directly on the punching or cutting device, i.e. the relocating device receives the blister at the punching or cutting device directly after it has been separated from the blister band, avoiding intermediate storage, wherein the engagement of the receiving device on the side of the blister opposite to the punching or cutting device prevents any collision between the receiving device and the advancing blister foil.

A conventional blister packaging machine usually checks whether the cups are completely filled and/or the blisters are sealed, upstream of the punching or cutting device, and the machine control knows which blisters have to be rejected. In the inventive method, the incomplete and/or improperly sealed blisters are rejected directly by the relocating device. When the relocating device has received the blister at the supply location, the drive of the relocating device can be controlled in different ways by the machine control. When the blister is recognized as being non-defective, the relocating device is controlled in such a fashion that it uses the blister to form a stack as mentioned above. If the blister is recognized as being defective, the relocating device performs a different motion preferably in the opposite direction to the normal motion pattern after receiving the blister and supplies the blister to a collecting station for defective blisters. This may be achieved e.g. in that the relocating device supplies the incomplete and/or improperly sealed blisters to an ejector shaft to be supplied to the collecting station for blisters to be rejected e.g. on the basis of their net weight.

Further details and features of the invention can be extracted from the following description of an embodiment with reference to the drawing.

Fig. 1 shows a schematic side view of an inventive relocating device which receives a blister;

Fig. 2 shows the device according to Fig. 1 with a non-defective blister being relocated;

Fig. 3 shows the device according to Fig. 2 with the blister being inserted into a cell of a conveying device;

Fig. 4 shows the device of Fig. 3 with the blister being deposited;

Fig. 5 shows the device of Fig. 4 with a further blister being deposited;

Fig. 6 shows the device of Figs. 4 and 5 with a third blister being deposited;

Fig. 7 shows the device with a defective blister being rejected; and

Fig. 8 shows the device of Fig. 7 directly before discharging the defective blister to an ejector shaft.

A blister packaging machine 10, only sections of which are shown in the figures, has an endless blister band 11 which is produced in a conventional fashion and which has a plurality of cups 12, each containing at least one product. The cups 12 are conventionally sealed with a covering foil 12a.

The blister band 11 is supplied to a cutting or punching device 13 which separates a blister 22 strip from the blister band 11.

The blister packaging machine 10 moreover comprises a continuous conveying device 18 which is designed as an endless conveyor belt 19 extending over deflecting rollers 21, which carries, on its outer side, a plurality of projecting walls 27 disposed at separations from each other to define intermediate cells 26.

The blisters 22 are separated from the blister band 11 using the punching or cutting device 13 and are relocated, using a relocating device 20, into a cell 26 of the conveying device 18, where they are deposited, thereby forming a stack S comprising several blisters 22.

The relocating device 20 comprises a disc-shaped carrier 15 with free projecting main arm 14. The carrier 15, together with the main arm 14, may be pivoted in both directions (indicated by the double arrow D_1) about a first pivot axis M_1 which is fixed to a frame. The first pivot axis M_1 is disposed below the punching or cutting device 13, between the latter and the conveying device 18. The pivot motion of the carrier 15 and the main arm 14 is effected by a first drive device (not shown) in the form of a first servomotor.

The main arm 14 may be adjusted relative to the carrier 15 to change the freely projecting length of the main arm 14 as is indicated by the double arrow L. A side arm 16 is hinged close to the free end of the main arm 14, and can be pivoted about a second pivot axis M_2 in both pivoting directions (indicated by the double arrow D_2). A second drive device (not shown), e.g. in the form of a second servomotor is provided for the pivoting motion of the side arm 16. The two pivot axes M_1 and M_2 extend parallel to each other, wherein the separation between the pivot axes M_1

and M_2 can be changed through adjusting the main arm 14 as indicated by the double arrow L.

A receiving device 17 in the form of a suctioning device is formed at the free end of the side arm 16 and can be conventionally loaded with an underpressure. An opening 24 of an ejector shaft 23 is disposed close to the motion path of the free end of the main arm 14, wherein an edge of the opening cross-section 24 forms a scraper 25.

The relocation of several blisters thereby forming a stack S is explained below with reference to Figs. 1 through 6. In the position of Fig. 1, the receiving device 17 abuts the side of the blister band 11 facing away from the punching device 13, at that section of the blister band 11 which is subsequently separated from the blister band 11 using the punching or cutting device 13, thereby forming a blister 22, the section being suctioned by the receiving device 17 using underpressure.

Directly after separating the blister 22 from the blister band 11, the main arm 14 pivots about the first pivot axis M_1 in the clockwise direction (see arrow T_1 of Fig. 2), while at the same time, the side arm 16 is pivoted in an anticlockwise direction about the second pivot axis M_2 (see arrow T_2 in Fig. 2). The motions of the main arm 14 and side arm 16 are matched and overlap each other such that the grasped blister 22 is moved directly above a cell 26 of the conveying device 18 and is subsequently inserted or lowered into the cell until the blister 22 is disposed on or at least close to its position within a stack being built (see Figs. 3 and 4). In the embodiment shown, the blister 22 represented in Figs. 1 through 4 forms the lower blister of the stack.

The relocating device 20 then returns into the initial position of Fig. 1 in a manner not shown and grasps a further blister 22 which is then inserted

into the same cell 26 of the conveying device 18 and placed on the previously disposed lower blister of the stack (Fig. 5). A third blister 22 is subsequently grasped by the relocating device 20 and disposed in the cell 26 onto the previously disposed blisters (Fig. 6).

A comparison of the representations of Figs. 4, 5 and 6, which each show the delivery position of the lower blister (Fig. 4), the central blister (Fig. 5) and the upper blister (Fig. 6) of the stack S, shows that the relocating device 20 or the main arm 14 and the side arm 16 assume different delivery positions for the individual blisters of the stack S, thereby performing different motions. In their deposition position, the blisters are very close to their final positions within the stack. This different motion control of the relocating device or the main arm 14 and/or the side arm 16 is ensured with great precision due to use of independent servomotors as drive devices for the main arm 14 and/or side arm 16.

When a stack S of a desired height has been formed in the cell 26 of the conveying device 18 using the relocating device, the conveying device 18 is moved forward by one cycle, such that a new stack can be analogously formed in the next cell 26.

When it has been determined by the blister packaging machine 10 and upstream of the punching or cutting device 13, that a cup 12 is e.g. not correctly filled with a product or that the covering foil 12a does not seal in the desired fashion, the corresponding blister must be rejected. This is effected in that the relocating device 20 does not dispose the defective blister 22' into the cell 26 of the conveying device 18 but passes it to the ejector shaft 23, as is shown in Figs. 7 and 8. Starting from the transfer position in accordance with Fig. 1, the main arm 14 is also pivoted about the first pivot axis M_1 in the direction of the arrow T_1 for relocating a blister 22' to be rejected. However, in contrast to relocating a non-

defective blister, the side arm 16 performs a pivot motion about the second pivot axis M_2 in the opposite direction of its usual motion, i.e. in accordance with Figs. 7 and 8 in a clockwise direction T_2'. The side arm 16 thereby projects past the free end of the main arm 14 and reaches the vicinity of the scraper 25 during pivoting of the main arm 14. The blister 22' being rejected is released from the receiving device 17 or the suctioning device at that location through switching off the receiving device 17 or the suctioning device and/or due to abutment of the scraper 25 on the rejected blister 22', such that the rejected blister 22' is completely released from the relocating device 20 and falls into the ejector shaft 23, at the free end of which the rejected blisters 22' are collected or transported away.